- 1 Applicant: Everett Simons
- 2 For: Robust, Low-Resistance Elastomeric Conductive Polymer Interconnect
- 1. An elastomeric device for electrically interconnecting two or more
- 2 components, comprising,
- an elastomeric matrix having one or more outer surfaces; and
- one or more electrically conductive pathways through said matrix, wherein at
- 5 least a portion of the electrical pathway contains a material that is an electrically
- 6 conductive liquid at the elastomeric device's operating temperature.
- 1 2. The device of claim 1, further comprising one or more electrically
- 2 conductive contact pads, wherein at least a portion of said pad is in electrical contact with
- 3 one or more of said pathways.
- The device of claim 1, wherein the electrically conductive liquid is a low
- 2 melting point metal or alloy.
- 1 4. The device of claim 3, wherein said metal is Gallium.
- The device of claim 3, wherein said alloy contains one or more metals
- 2 selected from the group of metals consisting of Gallium, Indium, Bismuth, and Tin.
- 1 6. The device of claim 1, wherein said pathways are anisotropic and
- 2 comprise between about 2 to 50% magnetic particles by volume of said elastomeric
- 3 matrix.
- The device of claim 1, wherein said matrix comprises one or more
- elastomers which retains most of its elasticity over a temperature range of between at
- 3 least 20° C to 75° C.

1	8. A method for making an elastomeric device for electrically
2	interconnecting two or more components, comprising the steps of:
3	embedding a plurality of magnetic particles, coated with a low melting point
4	metal or alloy, in an elastomer by mixing the particles in the elastomer before the
5	elastomer sets;
6	applying a magnetic field to the particles so that the particles align themselves in
7	electrically isolated columns;
8	heating the matrix sufficiently to fuse the low melting point coating; and
9	polymerizing the elastomer to form an elastomeric matrix having one or more
10	outer surfaces and comprising one or more electrically conductive pathways through the
11	matrix.
1	9. The method of claim 8, wherein the uncured elastomer is coated on a
2	carrier that contains conductive pads.
1	10. The method of claim 8, wherein the uncured elastomer is coated on a
2	carrier that contains one or more metal layers, the method further comprising the step of
3	creating one or more electrically conductive pads that are electrically continuous with at
4	least one electrically conductive pathway through the matrix.

- 1 11. An elastomeric device for electrically interconnecting two or more
- 2 components, comprising a matrix of electrically insulating elastomer that retains most of
- 3 its elasticity over a temperature range of at least 20°C to 75°C, containing an array
- 4 columns that are electrically conductive liquid over at least the upper range of the use
- 5 temperature of the device.
- 1 12. The device of claim 11, further comprising one or more electrically
- 2 conductive contact pads in electrical contact with said columns.

- 1 13. A method for making an elastomeric device for electrically
- 2 interconnecting two or more components, comprising the steps of:
- 3 creating an array of low melting point metallic columns on a carrier; and
- 4 laterally encapsulating said array in an electrically isolating elastomeric matrix.

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- 1 14. A method for making an elastomeric device for electrically
- 2 interconnecting two or more components, comprising the steps of:
- 3 creating an array of openings in an electrically isolating elastomeric matrix; and
- filling the openings with a material that is an electrically conductive liquid over at
- 5 least the upper range of the use temperature of the device.

- 1 15. An elastomeric device for thermally interconnecting two or more
- 2 components, comprising a matrix of electrically insulating elastomer that retains most of
- 3 its elasticity over a temperature range of at least 20°C to 75°C, containing an array of
- 4 columns that include thermally conductive liquid metal over at least the upper range of
- 5 the use temperature of the device.

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